

# DARPA Sensors for Immune Building Program

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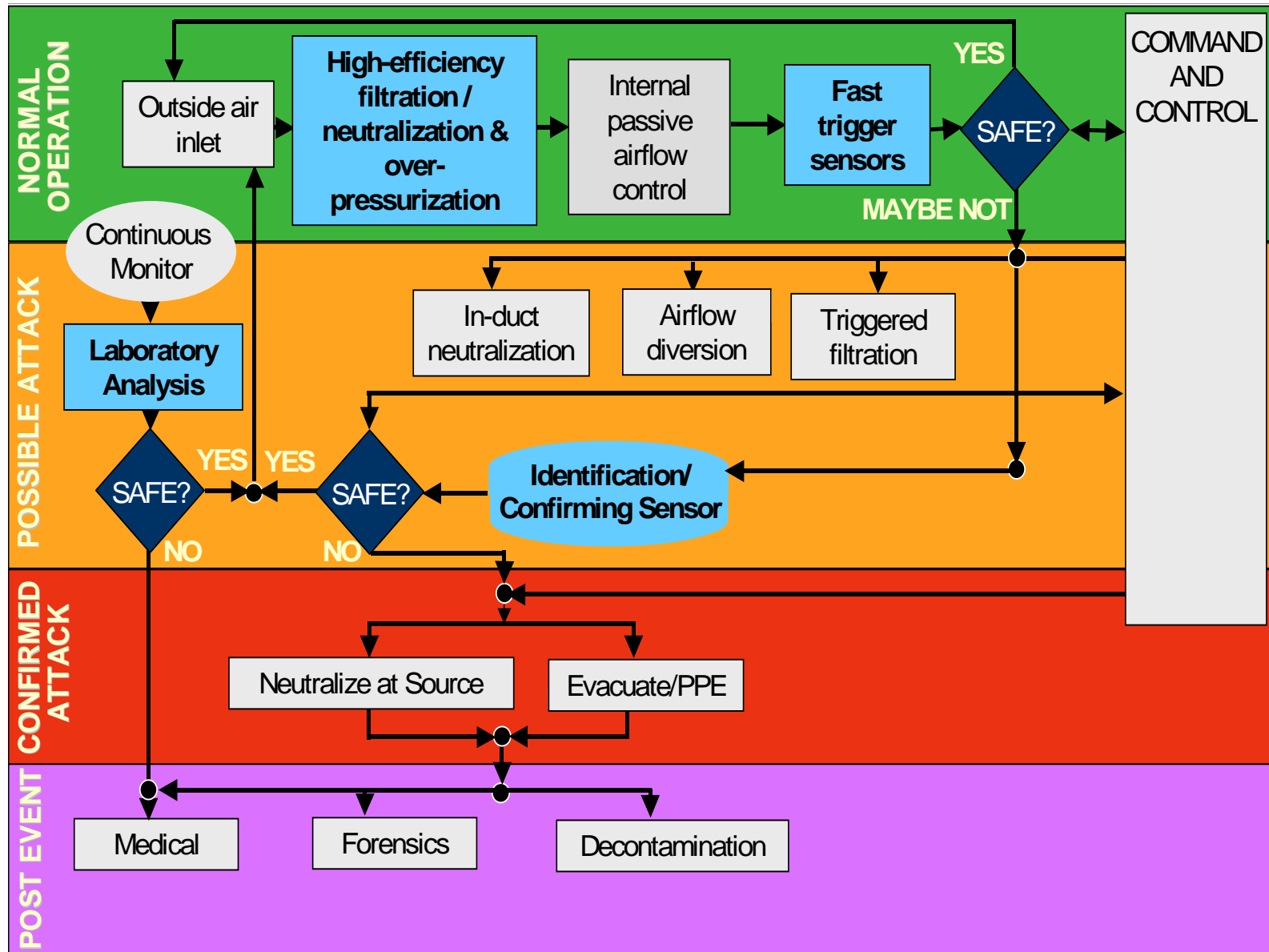
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# Problem Conception and Program Development



- The SIB Program develops point and stand-off sensors to enable the protection of military facilities and the associated military and civilian work forces within those facilities
- Develop sensors with:
  - Higher sensitivity
  - Lower false alarm rate
  - Broader agent coverage
  - Faster operation
  - Lower cost
- Sensors developed under the SIB Program will be transitioned to replace current sensors used for building protection



## A Standoff chemical detectors

- Reduces filtration and operating costs by allowing *on-demand* filtration/neutralization of external threats

## B Fast, cheap, biological triggers

- Detect at lower  $m_{rel}$  (better sensitivity)
- Improved sensor layout with lower-cost sensors
- Lower building protection operating costs (low false alarm rate)

## C Fast, cheap, chemical triggers

- Detect TICs/unfilterables
- Detect at lower  $m_{rel}$  (better sensitivity)
- Lower building protection operating costs (low false alarm rate)

## D Fast biological confirmatory sensors

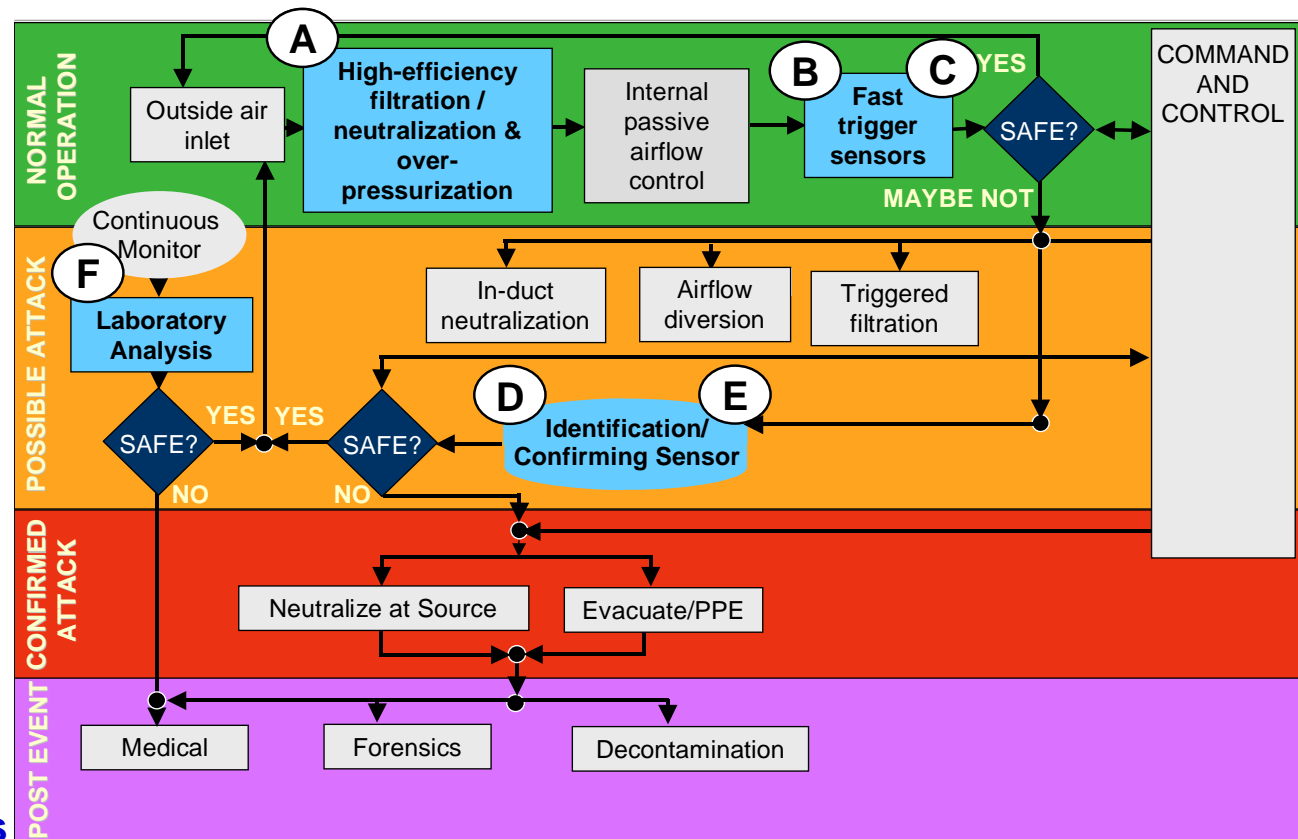
- Enables use of evacuation and personal protective equipment (PPE)
- Lower building protection operating costs

## E Fast chemical confirmatory sensors

- Enables use of evacuation and PPE
- Lower building protection operating costs

## F Laboratory analysis

- Improved "Gold Standard" testing
- Detect-to-treat capability





# SIB Program Sensors

## **A Standoff chemical detectors**

- JAGUAR/SAGE: standoff, passive IR hyperspectral detection & identification of airborne chemicals for wide area surveillance of fixed sites

## **B Fast, cheap biological triggers**

- Inexpensive Particulate Aerosol Sensor (IPAS): a bio-trigger based on particle counting/sizing and designed for wide proliferation with low initial purchase cost and low operating expenses
- Low Cost Particle Counter (LCPC): makes modification of the sampling and optical systems of existing particle counters to permit >2 months MTBM

## **C Fast, cheap chemical triggers**

- Photoionization Detector: a ganged photoionization detector to rapidly detect the presence of chemical agents and provide discrimination against background

## **D Fast biological confirmatory sensors**

- AP MALDI MS/MS: Atmospheric Pressure Matrix-Assisted Laser Desorption/Ionization tandem Mass Spectrometer; collect sample; rapidly treat with enzyme; measure peptides with AP-MALDI MS/MS; search database for peptide matches for organism detection
- Rapid Detection of Virions in Air: collect air sample on filter tape; apply large amount of two brightly labeled antibodies; use video imaging to detect binding
- Rapid Autonomous Bioagent Detection: cantilever bridged with single strand DNA (or other); when complimentary strand binds, cantilever deforms and current through cantilever changes indicating binding; clean probe by applying current that scales with stringency of binding



## **E Fast chemical confirmatory sensors**

- Point FTIR: develop field-hardened commercial prototype of FTIR (including multipass gas cell); incorporate SAGE algorithm for rapid identification of CWAs and TICs in presence of clutter
- Improved Differential Mobility Spectrometer (I-DMS): develop an optimized differential mobility sensor with improved sensitivity and specificity, while minimizing the effects of variable humidity and pressure
- Thermal swing Pre-concentrator (TSP): develop a “digital GC” using electrospray polymers coupled to piezoelectric heater/cooler module; couple with I-DMS
- Integrated Cavity Optical Sensor (ICOS): develop extremely long pathlength IR absorption system operating in the LWIR
- L-PAS/Freedom: develop prototype photoacoustic spectrometer operating in LWIR with frequency selectable  $^{13}\text{CO}_2$  laser

## **F Laboratory analysis**

- Rapid *Yersinia pestis* Viability: optimization of culturing growth parameters and reduction in the time required to determine viability of biological warfare agents
- Viral Viability and Toxin Activity: develop methods for the rapid detection of biological activity in a sample containing active toxin or viable virus
- Rapid Autonomous Integrated DNA Detection System (RAIDDS): reduce the time required to detect, identify, and confirm the presence and viability or activity of biological warfare agents.



# SIB Program Schedule

